Exhibit B

EXPERT REBUTTAL OPINIONS OF JAY VANDEVEN

Re:

BOARHEAD FARMS SUPERFUND SITE
Upper Black Eddy, Pennsylvania

Prepared for
Ballard Spahr Andrews & Ingersoll LLP

Prepared by

Jay Vandeven
Principal
ENVIRON International Corporation
Arlington, Virginia

November 15, 2006

1.0 BACKGROUND

In response to a request by Ballard Spahr Andrews & Ingersoll L.L.P of Voorhees, New Jersey, I have reviewed and prepared this rebuttal to the opinions expressed in reports submitted by the following expert witnesses on behalf of defendants in this case:

- W. Leigh Short, James F. Roetzer, and Gordon R. Jamieson of Alternative Environmental Strategies, LLC (AES)
- Franklin L. Mink of Entrix Corporation
- Kirk W. Brown of SI Group, LP
- Thomas E. Pease of HDR Engineering Inc.

I have also reviewed the expert report prepared on behalf of the plaintiffs by Jurgen H. Exner of JHE Technology Systems, Inc. I have also reviewed the documents Dr. Exner relied upon, which are listed in his report. I accept and agree with Dr. Exner's descriptions of the wastes associated with various industries and defendants.

This rebuttal report supplements my original expert report in this matter entitled *Expert Report of Jay Vandeven*, which was submitted on June 30, 2006. A summary of my qualifications, experience, previous testimony, documents I have previously reviewed, and billing rate were presented in my original expert report and are not repeated herein.

Since preparing my original expert report, I have reviewed the expert reports named above and many of the documents identified by the authors of those reports. A list of the supplemental materials and documents I have considered in forming my rebuttal opinions, in addition to the documents identified in my original expert report and those relied upon by Dr. Exner, is contained in Appendix A.

2.0 SUMMARY OF REBUTTAL OPINIONS

None of the opinions and arguments put forth in the expert reports named above have caused me to change the opinions expressed in my expert report of June 30, 2006. Specifically, I continue to hold the following opinions expressed in my expert report:

1. *The response activities address the environmental conditions caused by the disposal of wastes at the Boarhead Farms Superfund Site and are necessary and consistent with the National Contingency Plan.*

2. *All of the wastes disposed of at the Boarhead Farms Superfund Site contributed in some manner to the environmental conditions that led to the response activities described above.*

The expert reports submitted on behalf of defendants contain a number of statements that relate to the second opinion presented in my expert report. None of the reports named above dispute the first opinion or provide a comprehensive technical rebuttal of my second opinion. Some of the statements in the reports misrepresent the opinions expressed in my expert report; my responses to these statements are provided below in the context of broader supplemental support for my second opinion.

I have formed the opinions expressed in this rebuttal report and my original expert report to a reasonable degree of professional and scientific certainty. In forming my opinions, I have relied upon facts and/or data made known to me before I prepared this report of a type reasonably relied upon by experts in my field in forming such opinions. Should additional information become available prior to trial in this case, I reserve the right to supplement or amend these opinions.

3.0 BASIS OF REBUTTAL OPINIONS

The following points rebut statements made in the expert reports named above and provide supplemental support for the second opinion expressed in my earlier expert report.

1. Metals released to the environment as bulk wastes and drummed wastes contributed substantially to the need for and cost of the response activities taken at the Boarhead Farms Superfund Site.

This statement is based on the following observations:

- The initial response activities (i.e., the Preliminary Assessment ["PA"] and Site Investigation ["SI"] performed by an EPA contractor) were motivated by the history of waste disposal and releases at the Site. The PA report indicates that bulk releases of ferric chloride, copper ammonium carbonate, ammonia, and sulfuric acid were documented; some of these bulk wastes contained metals. Listing of the site on the NPL was caused by these documented releases and the potential threat to human health and the environment posed by the levels of organic and inorganic chemicals (including zinc, chromium, and lead) in groundwater.
- The removal actions conducted in 1992 and 1993 were necessary to address the presence of a wide variety of hazardous substances found in buried drums and contaminated soil; these substances included many metals. The total cost of the removal actions conducted from June 1992 to September 1993 was approximately $4,280,150. A substantial portion of this cost can be attributed to the levels of metals found in some of the materials, which caused them to be classified and handled as characteristic hazardous wastes.
- The non-time-critical removal action (i.e., the ground water extraction and treatment system installed and operated by the Corps of Engineers) and the subsequent remedial actions have been necessary to mitigate the risks to human health and the environment documented in the Remedial Investigation ("RI"). The baseline human health risk assessment concluded that the risks associated with residential use of

ground water at on-site and off-site locations (including many existing residential wells) exceeded acceptable limits. Metals contributed substantially to these unacceptable risks.

- As indicated in the Feasibility Study ("FS"), remedial action was necessary to address concentrations above standards for metals in soil and ground water. The concentration levels considered applicable in developing and selecting the remedial alternatives included ground water quality standards (Federal primary maximum contaminant levels and state health advisory limits) and site-specific discharge limits for wastewaters produced by the treatment of impacted ground water. All of the remedial alternatives that were considered protective of human health and the environment addressed these applicable standards and involved chemical precipitation of metals to meet the discharge limits. The FS cost estimate for chemical precipitation is $3,969,000.
- The remedial alternative selected for the site in the Record of Decision ("ROD") includes metals precipitation as part of the treatment process for extracted ground water. EPA notes that alternate discharge limit values may be developed, but treatment for metals will be required prior to discharge.
- When present at sufficiently high concentrations in certain environments, metals can hinder or prevent degradation of organic materials by inhibiting biological activity. This effect is acknowledged in paragraph 37 of the expert report submitted by Thomas Pease of HDR Engineering Inc.

2. Acid wastes released to the environment increased the mobility of metals and the corrosivity of the subsurface materials, thus contributing to the need for and cost of the response activities taken at the Boarhead Farms Superfund Site.

This statement is based on the following observations:

- Dr. Exner's report describes some of the acid wastes that may have been disposed of at the site in bulk or in drums. These acid wastes generally contained strong acids (sulfuric, hydrochloric, and nitric acids), in some cases at very high concentrations. Many of these acid wastes contained metals that were identified in the baseline risk

assessment as contaminants of potential concern ("COPCs"), and some also contained organic industrial wastes such as trichloroethene ("TCE").

- Most of the metals identified as COPCs in the risk assessment are cationic metals, which are generally more soluble in acidic solutions than in near-neutral conditions. The acidity of the acid wastes disposed of in bulk increased the acidity of the water in the subsurface, thus increasing the solubility and mobility of these metals.
- With respect to the ability of acids to mobilize metals, the RI states (page 5-4) "Solution of metals from oxide and oxyhydroxide coatings on soil could occur if certain chemicals were spilled at the surface and came in contact with the coatings. Such chemicals as acids and solvents would produce this effect. Both chemicals are known to have been disposed of on the surface at the site, so the migration of metals to groundwater probably was enhanced in the past." These sentences clearly indicate that disposal of acids tended to mobilize metals at the Site.
- Following the sentences cited above, the RI states "The effects of acid spills probably were short-lived because the acids would have been flushed from the soil by infiltrating water and possibly would have been neutralized by the limited buffering capacity of the soil." The RI also indicates, however, that a pH reading below 1 was obtained in the swamp a few days after a bulk release of ferrous chloride late in October 1973. Lime was spread in the affected area to neutralize the acid. Dying fish and trees were reported about half a mile from the release site in January 1974, and pH measurements made at three locations in July 1974 (more than eight months after the release) were only 2.9. "Short-lived" is a relative term; the facts demonstrate that the effects of bulk disposal of acid wastes persisted for months (if not longer) even after lime was applied, and that these effects were observed at a considerable distance from the disposal location.
- As cited in the preceding observation, the RI suggests that acids would have been neutralized by "the limited buffering capacity of the soil." Neutralization of acids by interaction with the soil depletes this buffering capacity, resulting in a subsurface environment that is more susceptible to significant changes in pH. This facilitates the migration of chemicals that are more soluble in either acidic or basic conditions.

Thus, early releases of acid wastes would have facilitated the migration of contaminants released at later times.

- Many of the buried drums found at the Boarhead farms site were removed from areas that are downgradient of some of the likely bulk disposal locations. Metal drums that were placed in soils that had been affected by earlier releases of acids would tend to corrode faster than drums placed in unaffected soils. Releases of acid that occurred after the drums were in place would also have increased the rate of corrosion. Thus, releases of acid to the subsurface environment tended to increase the rate at which the buried drums released their contents.
- The RI also states (page 5-5) that "Acids disposed of at the surface probably destroyed microorganisms in the surface and subsurface soil, thereby reducing the extent of biodegradation." Over time, biodegradation of the organic compounds released at the site would tend to reduce the levels of COPCs in the environment and the risks associated with them. Thus, in addition to increasing the mobility of metals, releases of acid tended to increase the persistence of organic COPCs, thus increasing the need for and cost of remediation.

3. Disposal of materials that do not exhibit the characteristics of hazardous waste, including materials that are essentially inert, contributed to the environmental conditions that led to the response activities taken at the Boarhead Farms Superfund Site.

This statement is based on the following observations:

- Even releases or burial of inert materials (if they occurred) would have affected soil moisture levels, soil structure and permeability, groundwater elevations and recharge rates, and other factors that can influence the fate and transport of the chemicals addressed by the response activities.
- Even if their pH was nearly neutral, releases of large quantities of liquids would cause increased migration of materials in the subsurface. This would tend to reduce the concentrations of hazardous substances and spread them over a larger area. Unless the concentrations were reduced to levels below the applicable standards, these effects could increase the area to be remediated and the volumes of various

media to be addressed, thus increasing the total response costs.

4. The various wastes disposed of at the Boarhead Farms site interacted with other wastes and environmental media in a very complex manner to cause the environmental conditions that led to the response activities.

This statement is based on the observations presented under items 1, 2, and 3 above and the essential facts of this case: that a wide variety of wastes were released in varying modes (bulk disposal, drum burial) at both known and unknown locations over a period of years into a complex environment. The behavior of metals and organic chemicals in the subsurface environment is influenced by many factors and processes. With respect to the mobility of these chemicals in environments where large quantities of various chemical wastes have been released, relevant factors include soil characteristics, acidity (pH), oxidation-reduction potential, the concentration of the chemical of interest, and the concentrations and types of other chemicals and complexing ligands (both organic and inorganic) that are present. General statements regarding the behavior of chemicals that do not account for site-specific conditions will not necessarily be predictive of the behavior of metals and organic chemicals in a specific environment.

As an example of the complex nature of this case, consider paragraph 56 of Dr. Kirk Brown's expert report. This paragraph suggests that the degreaser sludge produced by Handy & Harman would not have contributed significantly to the need for or cost of the remedy for the site. In response, I note that the description of the degreaser sludge provided in his paragraph 55 does not establish that the amount of free liquid TCE was minimal; materials described as sludges and handled with shovels may contain substantial quantities of liquids. In addition, if the volume of degreaser sludge was as small as suggested in paragraph 60 of Dr. Brown's report, the drums that contained the degreaser sludge may well have contained other liquid wastes. The degree to which the TCE was partitioned in the sludge would likely depend on the other constituents of the waste in the drum; if water was present, it probably contained dissolved TCE. If the drums that contained these wastes deteriorated after burial at the Boarhead Farms site, the components of the Handy & Harman wastes would have been released to the subsurface environment where they would interact with the water, soil, and other wastes. The fate and transport of the Handy & Harman TCE would

then be dependent on local characteristics of the subsurface environment that were largely determined by prior releases and that may have varied substantially over small distances and short time periods.

APPENDIX A
ADDITIONAL MATERIALS REVIEWED AND RELIED UPON

Documents relied upon by Dr. Jurgen Exner as listed in his expert report of June 29, 2006

Agency for Toxic Substances and Disease Registry 2000. Toxicological Profile for Chromium. September.

Agency for Toxic Substances and Disease Registry 2005. Toxicological Profile for Arsenic. September.

Code of Federal Regulations, Title 40 Part 261

EPA 1992. Ground Water Issue: Behavior of Metals in Soils. EPA/540/S-92/018. October.

EPA 1994. Natural Attenuation of Hexavalent Chromium in Groundwater and Soils. EPA/540/5-94/505. October.

EPA 2004. Understanding Variation in Partitioning Coefficient, Kd, Values (volume III). EPA 402-R-99-004C. July.

EPA 2005. Introduction to Hazardous Waste Identification (40 CFR Parts 261). EPA530-K-05-012. September.

EXPERT REPORT OF JAY VANDEVEN

Re:

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Upper Black Eddy, Pennsylvania

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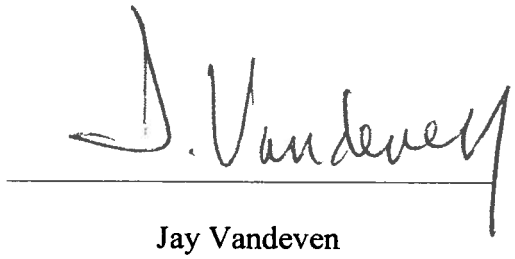

Jay Vandeven
Principal
ENVIRON International Corporation
Arlington, Virginia

June 30, 2006

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ATTACHMENTS

1. INTRODUCTION AND SUMMARY OF OPINIONS

I have been retained by the plaintiffs in this case through the law firm of Ballard Spahr Andrews & Ingersoll LLP to review the data and documents related to the Boarhead Farms Superfund Site located on Lonely Cottage Road, Upper Black Eddy, Bridgeton Township, Bucks County, Pennsylvania (the "Site") and to provide my opinions on certain topics related to the investigation and remediation of the Site. Specifically, I was asked to provide a report that summarizes the response activities taken at the Site and includes my opinions regarding the following general topics:

1. The consistency of the response activities with the relevant federal environmental regulations; and

2. The relationship between the wastes that were disposed of at the Site and the environmental conditions that led to the response activities.

Section 2 of this report describes the response activities taken at the Site. Section 3 outlines my qualifications and experience and Section 4 identifies the materials that I relied on to form my opinions. My opinions regarding the topics I was asked to address are summarized below:

1. *The response activities address the environmental conditions caused by the disposal of wastes at the Boarhead Farms Superfund Site and are necessary and consistent with the National Contingency Plan.*

2. *All of the wastes disposed of at the Boarhead Farms Superfund Site contributed in some manner to the environmental conditions that led to the response activities described above.*

The basis of these opinions is provided in Section 5.

2. RESPONSE ACTIVITIES

This section summarizes the federal response activities taken at the Boarhead Farms Superfund Site. The Site was the subject of a number of complaints, investigations, and legal actions performed by local and state (Pennsylvania) agencies prior to the initial federal action. The federal response activities include (in chronological order):

1. An EPA contractor (NUS Corporation) completed a Preliminary Assessment ("PA") and Site Investigation ("SI") of the Site between 1984 and January 1986. The PA and SI reports state that the Site was brought to EPA's attention by a citizen's complaint. Access to the site for an on-site inspection was initially denied, so the PA was completed using documents obtained from the files of the state and local authorities. The SI report describes sampling of groundwater, surface water, sediment, and soils in May 1984 and notes that another EPA contractor collected samples off-site in April 1984. The data obtained from the on-site samples demonstrate the presence of a variety of contaminants, including organic compounds as well as the inorganic contaminants (e.g., cyanide, acids, and metals) associated with the documented releases at the Site. The toxicological evaluation provided in the SI report notes that carcinogenic organic compounds were found in surface waters and some water supply wells.

2. EPA proposed inclusion of the Boarhead Farms site on the National Priorities List ("NPL") on June 24, 1988 (53 FR 23978) and added the Site to the NPL on March 31, 1989 (54 FR 13296). According to a later report, the Hazard Ranking System ("HRS") score for the Site was 39.9 (sites with scores greater than 28.5 are eligible for the NPL), and this score was due primarily to elevated levels of organic contaminants (including trichloroethene and 1,1,1-trichloroethane) and inorganic contaminants (including zinc, chromium, and lead) in groundwater.

3. After the NPL listing, an EPA contractor (CH2M HILL) initiated a Remedial Investigation and Feasibility Study ("RI") of the Site. A magnetometer survey conducted as part of the RI in 1991 identified many areas where the presence of buried metal (e.g., drums) was suspected. At the request of EPA's Remedial Branch,

EPA's Removal Branch conducted two removal actions for buried drums and contaminated soils, one in 1992 and the second in 1993. More than 2,000 drums were removed from the Site in these removal actions along with more than 8,400 tons of contaminated soil and more than 4,000 gallons of wastewater. Nearly half of the buried drums removed were empty, which suggests that their contents had leaked out into the environment over time. The materials in the non-empty drums were liquid and solid wastes that contained a wide variety of hazardous substances, both organic (including benzene, carbon tetrachloride, methyl ethyl ketone, 1,2-dichloroethane, 2,4-dinitrotoluene, nitrobenzene, trichloroethylene, and tetrachloroethylene) and inorganic (including arsenic, cyanide, cadmium, chromium, lead, mercury, selenium, and silver).

4. During EPA's second (1993) removal action, certain wastes associated with General Ceramics, Inc. were discovered. General Ceramics arranged for removal and off-site disposal of three drums of radioactive material, 72 drums of hazardous waste, and approximately 880 cubic yards of contaminated soil.

5. EPA initiated a separate non-time-critical removal action in 1995. Various organic and inorganic chemicals (including benzene, trichloroethylene, chromium, nickel, and thallium) had been found in groundwater at concentrations above the Maximum Contaminant Levels ("MCLs") established under the Safe Drinking Water Act. The objective of this removal action was to minimize migration of contaminated groundwater and treat private water supplies as needed. Public exposure to contaminated groundwater was controlled by installing individual well treatment systems at 16 residences, including one on the Boarhead Farms site. In addition, a system to collect and treat contaminated groundwater on-site was designed and installed by the U.S. Army Corps of Engineers under contract to EPA. This system went into operation in October 1997.

6. The RI for the Site was completed in January 1997. The RI report describes the nature and extent of contamination associated with the Site. It also includes the Baseline Human Health Risk Assessment, which identifies 16 metals and 37 organic compounds as contaminants of potential concern and concludes that the risks

associated with on-site and off-site groundwater exceed the acceptable limits due to elevated levels of volatile organic compounds ("VOCs") and metals (especially arsenic and chromium). The relative contributions of the various chemicals to the cumulative carcinogenic and non-carcinogenic risks vary from one well to another.

7. Under EPA's direction, CH2M HILL completed the Feasibility Study ("FS") for the Site in 1997. The FS report describes six sitewide remedial action alternatives that address both soil and groundwater. Each alternative is evaluated against the criteria described in the National Contingency Plan, and a comparative analysis of the sitewide alternatives is provided.

8. EPA issued the Proposed Plan for the Site in January 1998. The Proposed Plan describes EPA's preferred alternative, which includes the following components:

   - Soil aeration and treatment of VOC hot spots;
   - Excavation and off-site disposal of buried drums;
   - Groundwater extraction, metals precipitation, and air stripping;
   - Institutional controls and monitoring; and
   - Residential water treatment.

   A public comment period was established (initially January 5 to February 4 and later extended to April 5, 1998) and a public meeting was held on January 14, 1998 to discuss the Proposed Plan.

9. EPA issued the Record of Decision ("ROD") for the Site in November 1998. The ROD presents the final selected remedial action, which includes two components that were not described in the Proposed Plan:

   - Installation of additional monitoring wells; and
   - Phytoremediation studies.

   These additions and other minor changes were made as a result of public comments on the Proposed Plan.

10. After issuing the ROD, EPA solicited offers to perform the Remedial Design ("RD") and Remedial Action ("RA") tasks necessary to implement the ROD from a number of Potentially Responsible Parties ("PRPs"). In the course of negotiations, EPA divided the RD/RA actions to be performed under the ROD into two Operable Units ("OUs"). In general, the first OU ("OU-1") addresses contaminated groundwater and the second OU ("OU-2") addresses the remaining buried drums and contaminated soil.

11. A group of PRPs performed the RD/RA actions for OU-1 under an Administrative Order and a Consent Decree with EPA. The OU-1 remediation encompassed the following components of the sitewide remedy described in the ROD:

    - Groundwater extraction, metals precipitation, and air stripping;
    - Installation of additional monitoring wells;
    - Institutional controls and monitoring;
    - Residential water treatment; and
    - Phytoremediation studies.

    The groundwater collection and treatment system installed under the non-time-critical removal action (item 5 in this list) was upgraded to improve performance and meet the requirements of the ROD remedy. Conditions on and off the Site are being monitored under a long-term monitoring plan approved by EPA. Residential water treatment and operation of the upgraded groundwater collection and treatment system are continuing.

12. A group of PRPs performed the RD/RA actions for OU-2 under a separate Administrative Order and Consent Decree with EPA. The OU-2 remediation addressed the remaining components of the sitewide remedy described in the ROD:

    - Soil aeration and treatment of VOC hot spots;
    - Excavation and off-site disposal of buried drums; and
    - Institutional controls and monitoring.

Construction activities involved in implementation of these components of the remedy described in the ROD were completed in November 2003.

3. QUALIFICATIONS

I am a Principal of ENVIRON International Corporation ("ENVIRON") in Arlington, Virginia. ENVIRON is an international consulting firm that provides scientific, engineering and strategic risk management services to clients in the public and private sectors.

I received a Bachelor of Science degree in Civil Engineering from Clemson University in 1982 and a Master of Science in Environmental Engineering from Clemson University in 1985. I have been employed at ENVIRON from 1985 to 1986 and from 1994 to the present. From 1987 to 1993 I was a senior environmental engineer with the consulting firm of CH2M HILL.

My academic training and professional experience have focused on the sources, movement, and remediation of chemicals in the environment. I have been involved in the study and remediation of hundreds of contaminated properties and sites throughout the United States, Canada, and Eastern Europe. I have managed the investigation and remediation of Comprehensive Environmental Response, Compensation, and Liability Act ("CERCLA") National Priorities List ("NPL") sites and Resource, Conservation and Recovery ("RCRA") sites. My industrial experience includes work at a wide range of complex manufacturing facilities, including wood treating sites, manufactured gas plants, petroleum refineries, and chemical plants. I have provided consulting services to the United States Environmental Protection Agency (USEPA), the United States Departments of Defense and Energy, the United States Department of Justice, and private industry.

I have been retained to render expert opinions in more than twenty-five environmental matters. I have provided expert opinions in the areas of National Contingency Plan (NCP) consistency, allocation of response costs, the causes and timing of environmental property damage, and the appropriateness of remedial actions. I have been previously qualified as an expert in federal court in the areas of CERCLA, RCRA, the NCP, and chemical fate and transport.

My compensation in this matter is $235 per hour. A copy of my *curriculum vitae*, which includes a list of my publications and presentations, as well as a list of my expert testimony, is provided in Attachment A.

4. MATERIALS REVIEWED AND RELIED UPON

The opinions set forth in this report are based on my twenty years as an environmental professional. In addition, I have reviewed the documents listed in Attachment B of this report, which include environmental regulations, correspondence, invoices, and reports related to the response activities.

5. BASIS OF OPINIONS

This section provides the basis of each of my opinions.

Opinion 1: *The response activities address the environmental conditions caused by the disposal of wastes at the Boarhead Farms Superfund Site and are necessary and consistent with the National Contingency Plan.*

The federal regulations that apply to hazardous substance release sites are part of the National Oil and Hazardous Substance Contingency Plan ("NCP"), which appears in part 300 of Title 40 of the Code of Federal Regulations. The NCP provides both the process and the specific requirements for addressing releases or threats of releases of hazardous substances. The assessment of threats and risks is a central element of the NCP and the process contained therein. Similarly, the development, evaluation, and selection of remedial alternatives that appropriately address those threats and risks are a key function of the NCP. The general response actions taken at the Boarhead Farms Superfund Site are described in Section 2 of this report. Prior to the initial federal actions described in that section, a number of releases of hazardous substances to the environment had occurred and been documented.

I have reviewed the record for the Site and have concluded that the response actions taken were necessary to respond to documented threats and risks posed by hazardous substances at the Site and that these actions were appropriate and consistent with the NCP. The following provides a summary of the major response actions at the Site and the basis for my conclusion that they were necessary and consistent with the NCP.

- After the listing of the Site on the NPL in 1989, a RI was initiated in 1991. As part of the RI, a magnetometer study was performed to identify the presence of buried drums. The two emergency removal actions that were performed in 1992 and 1993 to address buried drums and associated contaminated soil were

appropriate response actions under the NCP. In Section 300.415 of the NCP, the presence of hazardous substances or contaminants in drums and the threat of fire and explosion are explicitly listed as factors to be considered in determining the appropriateness of a removal action. Further, removal of drums and highly contaminated soils are listed as appropriate response actions.

- The 1995 non-time critical removal action included addressing documented exposures to contaminated groundwater. As required by the NCP an Engineering Evaluation/Cost Analysis ("EE/CA") was performed. Public exposure was controlled by installing individual well treatment systems at 16 residences. Section 300.410 of the NCP specifically includes the provision of an alternate water supply as an appropriate removal action to address exposure to contaminated groundwater. The EE/CA also noted that groundwater is the sole source of drinking water to 100 residences within one mile of the Site. To address these potential exposures, the EE/CA recommended recovery and treatment of contaminated groundwater. This system was put into operation in October 1997.
- The RI at the Site was completed in 1997 and addressed both the overall goal and specific requirements of the NCP. The two overall objectives of the RI are 1) to gather data necessary to characterize the site for purposes of developing and evaluating remedial alternatives and 2) to provide information to assess the risks to human health and the environment and to support the development, evaluation, and selection of appropriate response alternatives. These objectives were met by assembling data and information from a variety of sources, conducting field studies, and performing risk assessments. The RI involved sampling and analysis of soils, groundwater, surface water, and sediment to characterize the nature and extent of contamination at the Site. The risk assessment sections of the RI address both ecological and human health risks.
- The FS was also completed in 1997. As required by the NCP, the FS developed and evaluated a number of appropriate remedial alternatives. The evaluation of alternatives included a comparative analysis that addresses the relative performance of each alternative against the criteria defined in the NCP.

- EPA selected the remedial action described in the ROD through the two-step process established in the NCP. In the first step, EPA presented the preferred alternative in the Proposed Plan for review and comment by the public. In the second step, EPA reviewed the public comments, made the final remedy decision, and documented this decision in the ROD.
- The remedy described in the ROD has been implemented by two groups of PRPs. Each of the components of the remedy described in the ROD has been addressed. The remedial designs and remedial actions conducted by the PRP groups were approved by EPA. The costs incurred by the PRP groups are related to activities required by the NCP. In my opinion, the PRP groups' costs (approximately $3.24 million for OU-1 and $2.19 million for OU-2 through November 2005) and the anticipated costs associated with ongoing performance of the RD/RA under the terms of the consent decrees are reasonable given the requirements of the ROD and the characteristics of the Site.

Opinion 2: *All of the wastes disposed of at the Boarhead Farms Superfund Site contributed in some manner to the environmental conditions that led to the response activities described above.*

This opinion is based on the following points:

- The initial response activities (i.e., the PA and SI) were motivated by the history of waste disposal and releases at the Site. The PA report indicates that bulk releases of ferric chloride, copper ammonium carbonate, ammonia, and sulfuric acid were documented. Listing of the Site on the NPL was caused by these documented releases and the potential threat to human health and the environment posed by the levels of organic and inorganic chemicals (including trichloroethene, 1,1,1-trichloroethane, zinc, chromium, and lead) in groundwater. The removal actions conducted in 1992 and 1993 were necessary to address the presence of a wide variety of hazardous substances found in buried drums and contaminated soil. The non-time-critical removal action and the subsequent remedial actions have been necessary to mitigate the risks to human health and the environment documented in the RI.
- All of the wastes disposed of at the Site contributed in some manner to the conditions that required response activities. Even releases or burial of inert materials (if they occurred) would have affected soil moisture levels, soil structure and permeability, groundwater elevations and recharge rates, and other factors that can influence the fate and transport of the chemicals addressed by the response activities. The ferric chloride, copper ammonium carbonate, sulfuric acid, and other bulk liquid wastes (such as spent etching solutions, acids, and pickling wastes) released at the Site generally contained substantial quantities of metals. Because most metals are more soluble in acidic solutions, the acidity of these wastes increased the mobility of metals in the subsurface environment. Even corrosive waste solutions that did not contain metals (if any such wastes were released) would have promoted the degradation of buried drums and altered

the subsurface environment in ways that increased the mobility and persistence of hazardous chemicals. Such solutions may also have mobilized metals that were naturally present in the soils at the Site.

- The early response activities to address the presence of buried drums (in particular, the emergency removal actions) were necessary because of the history of waste disposal (documented releases) at the Site. In light of this history, these actions would have been appropriate even if the buried drums had not contained or released hazardous substances.
- The characteristics and regulatory status of the wastes that were disposed of in drums are described in documents related to the drum removal actions and the OU-2 remedial action. These wastes include acidic, neutral, and basic (alkaline) wastes containing a variety of organic and inorganic chemicals. Collectively, these wastes exhibited the characteristics of ignitability, corrosivity, reactivity, and toxicity under the hazardous waste identification system established pursuant to the Resource Conservation and Recovery Act ("RCRA"). The inorganic chemicals that contributed to the identification of these materials as RCRA hazardous wastes include arsenic, cadmium, chromium, lead, mercury, selenium, and silver. The organic chemicals that contributed to this identification include benzene, tetrachloroethylene, trichloroethylene, 1,2-dichloroethane, 2,4-dinitrotoluene, nitrobenzene, methyl ethyl ketone, 2,4-dichlorophenol, and carbon tetrachloride.
- Releases of substances that are not considered RCRA hazardous wastes also contributed to the environmental conditions addressed by the response activities. For instance, polychlorinated biphenyls ("PCBs") were present in some of the drummed wastes. Although PCBs are regulated under the Toxic Substance Control Act ("TSCA"), not RCRA, they are considered highly toxic and are the primary chemical of concern at a number of Superfund sites. In addition, wastes that do not exhibit the RCRA characteristic of corrosivity (i.e., that exhibit a pH between 2 and 12.5) can still promote disintegration of metal drums. Even near-neutral acidic wastes consume some of the buffering capacity of the soils; this

facilitates the migration of many chemicals (e.g., metals) that are more soluble in acidic or basic conditions.

- The wastes disposed of at the Site may have included pickle liquors. Pickle liquors are acid solutions used to descale or clean steel in various steelmaking processes. Typically, the acids employed in the pickling of steel are hydrochloric, nitric, sulfuric and hydrofluoric acids or combinations thereof. Spent pickle liquor contains these acids and a variety of metals (including iron, nickel, chromium, and others) and is listed as a RCRA hazardous waste (K062) by EPA due to its corrosivity and toxicity. If released to the environment at the Boarhead Farms site, pickle liquors increased the acidity and the levels of metals in both soil and groundwater.
- Circuit board etchant may have been among the wastes disposed of at the Site. Circuit board etchant is an acidic solution used to dissolve copper in the manufacure of printed circuit boards. Spent etchant is composed primarily of cupric chloride and may contain a variety of acids and metals (including copper, tin, lead, gold, and others). If released to the environment at the Boarhead Farms site, circuit board etchants increased the acidity and the levels of metals in both soil and groundwater.
- Various waste streams generated during nickel and chromium plating plating operations may have been disposed of at the Site. Typically, these wastes contain acids, cyanide, and a variety of metals (especially nickel, copper, and chromium). Certain wastewater treatment sludges associated with plating operations are listed as RCRA hazardous wastes (F006 and F007) by EPA due to their toxicity and (for F007 sludges associated with cyanide plating baths) reactivity. If released to the environment at the Boarhead Farms site, nickel and chromium plating wastes increased the acidity and the levels of metals in both soil and groundwater.
- A variety of solvent-containing wastes were apparently disposed of at the Site. Certain wastes that contain halogenated solvents are listed as RCRA hazardous wastes (F001 and F002) by EPA due to their toxicity. Some wastes that contain non-halogenated solvents are listed as RCRA hazardous wastes (F003, F004, and

F005) are listed for their toxicity and/or ignitability. Solvents contained in wastes disposed of at the Boarhead Farms site contaminated the soil and groundwater.

The Boarhead Farms site is approximately 120 acres in size. Roughly half of the area is wooded and nonwooded wetlands; the rest of the area includes wooded uplands, open fields, manmade ponds, and various structures. The primary land use in the vicinity of the Site is residential and the topography is rolling and hilly. The upper surface of the bedrock that underlies the Site (which is diabase, an intrusive volcanic rock) is weathered and moderately fractured. The depth to bedrock varies across the Site from less than five to more than ten feet. The primary migration pathway for contaminants at the Site is through the shallow groundwater system that exists in and above the upper zone of the bedrock. Wastes released at the Site entered the subsurface environment and this shallow groundwater system as a result of natural processes (such as gravity-driven flow of liquids and infiltration of rainwater and snowmelt) and human activities (such as burial of drums and disposal in pits).

The need for remediation at the Site is driven by inorganic chemicals (especially metals) and organic chemicals (especially VOCs) in soil and groundwater. Disposal of wastes at the Site released a wide variety of hazardous substances to the environment. Releases of ferric chloride, ammonia, sulfuric acid, and copper ammonium carbonate are documented in the files of state and local agencies. These and other wastes released in bulk were generally corrosive and likely contained substantial quantities of metals such as iron, nickel, chromium, cobalt, copper, gold, magnesium, manganese, nickel, tin, titanium, vanadium, and zinc. The chemicals found in the drums removed from the Site include arsenic, cadmium, chromium, lead, mercury, selenium, silver, benzene, tetrachloroethylene, trichloroethylene, 1,2-dichloroethane, 2,4-dinitrotoluene, nitrobenzene, methyl ethyl ketone, 2,4-dichlorophenol, carbon tetrachloride, PCBs, and others.

Once released, the mobility and persistence of each chemical in the subsurface environment are dependent on the characteristics of the chemical of interest and the

characteristics of the environment into which that chemical has been released. The characteristics of the hazardous substances listed above vary widely. With respect to persistence, the organic compounds are degraded at various rates by chemical and biological processes, while the metals (which are elements) will not degrade at all. With respect to mobility, some of the chemicals were released as liquid wastes or are easily dissolved in water; these chemicals are generally more mobile than those that were released as solids, do not dissolve readily, or tend to adhere to soil particles. The physical, chemical, and biological characteristics of the subsurface environment may have a substantial influence on the mobility and persistence of a specific chemical. For example, most metals are considerably more soluble in acidic conditions, so any release of acidic materials would have promoted the migration of metals.

After release, all of the wastes with common characteristics had similar and cumulative effects on the geochemistry of the environment. For example, all of the wastes that contained certain VOCs contributed to the need for the components of the remedy that address these contaminants in soil (i.e., the soil aeration operations) and groundwater (i.e., the air stripper and the home water treatment systems). Similarly, all corrosive wastes (both acidic and basic) tended to promote the degradation of metal drums and the release of their contents to the environment, and all of the acidic wastes increased the concentrations and mobility of the metals, which increased the cost and complexity of the groundwater extraction and treatment systems. Thus, even waste materials that may not have exhibited the characteristics of RCRA hazardous wastes contributed to the environmental conditions that led to the response activities.

ATTACHMENT A
CURRICULUM VITAE

EDUCATION

1985 M.S. Environmental Engineering, Clemson University

1982 B.S. Civil Engineering, Clemson University

EXPERIENCE

Mr. Vandeven is a Principal at ENVIRON International Corporation. He has a broad environmental engineering background, with expertise in the assessment and remediation of soil and groundwater. He has extensive experience in CERCLA/RCRA regulatory affairs, fate and transport analysis, environmental litigation and cost allocation. Mr. Vandeven has provided expert testimony in numerous cases involving CERCLA cost recovery, insurance coverage, and toxic tort suits. His experience includes the following:

- Managing remedial investigations and remedial actions at complex industrial sites, federal and state Superfund sites, and RCRA facilities.
- Conducting RCRA facility assessments and RCRA facility investigations.
- Performing risk assessments at RCRA and CERCLA sites.
- Analyzing chemical fate and transport of metals and organics in groundwater, surface water and soil.
- Providing expert opinions on issues of cost allocation, NCP consistency, and the appropriateness of remedial measures.

Prior to joining ENVIRON, Mr. Vandeven held the following positions:

SENIOR ENGINEER AND PROJECT MANAGER – CH2M HILL

Conducted and managed remedial investigations and remedial actions for private industry and the USEPA.

STAFF ENGINEER – ENVIRON INTERNATIONAL CORPORATION

Conducted remedial investigations, due diligence audits and risk assessments.

STAFF SCIENTIST – DUPONT CORPORATION, SAVANNAH RIVER LABORATORY

Modeled the migration of radionuclides from low-level waste facilities.

PUBLICATIONS AND PRESENTATIONS

Vandeven, J. 2005. Mercury Use in the Dental Industry *Presented at the Environmental Law Institute Public Forum on Alternative Strategies for Addressing Mercury Pollution.* Washington, DC, January.

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Highland, J. and Vandeven, J. 1996. The Role of Experts in Long Tail Tort Cases. Presented at *The New Wave of Toxic Torts Conference*. New York, January.

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Vandeven, J. 1985. The Role of Adsorption in Radionuclide Transport in Lake Hartwell. M.S. Thesis, Clemson University, Clemson, South Carolina.

EXPERT TESTIMONY OF JAY VANDEVEN

The following are cases where Mr. Vandeven has provided expert testimony:

For Sun Oil Company in *Jalisco Corporation, Inc., et al., s. Argonaut Insurance Company et al.,* Superior Court or the State of California. No. BC158441.

For Beazer East, Inc. in *Beazer East, Inc. v. The Mead Corporation v. Koppers Industries, Inc.,* U.S. District Court, Western District, Pennsylvania, Civil Action No. 91-408.

For *1325 G Street Associates, L.P. v. Rockwood Pigments NA, Inc., v. Percontee Inc.,* U.S. District Court, District of Maryland, Southern Division, Civil No. DKC-02-1622.

For Fruehauf Production Company L.L.C. in *Fruehauf Production Company, L.L.C. and Fruehauf Antrim Limited Partnership v. TIFD III-X LLC*, Court of Chancery of the State of Delaware in and for New Castle County, Delaware, Consol. C.A. No. 20488-NC.

For Southern Natural Gas Company in *Southern Natural Gas Company, a Delaware Corporation v. Certain Underwriters at Lloyd's, London and Certain London Market Insurance Companies, foreign companies, and Alabama Insurance Guaranty Association*, Circuit Court, Jefferson County, Alabama,
Case No. CV0106388.

For Merck & Company in *Amsted Industries, Inc. vs. Merck & Company, Inc.* (arbitration)

For GE Capital Franchise Finance Corporation in *American International Specialty Lines v. GE Capital Franchise Finance Corporation* (arbitration?)

ATTACHMENT B
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